

Scale up of biophysical and environmental analysis of proposed SSI interventions: summary of aims, timeline, methodology and progress

Aim/timeline

The aim of the upscaling analysis is to assess the potential for expansion of small-scale irrigation in ILSSI project countries, as well as the impacts of large-scale implementation of SSI on biophysical factors (e.g., crop yields), environmental sustainability, and economic and family welfare. The upscaling analysis has begun in Ethiopia, where data collection is almost complete, and is slated for completion in year four of the ILSSI project. In Tanzania and Ghana, data collection efforts are underway, and the upscaling analysis is scheduled to begin in year four.

Approach

The intensification of small-scale irrigation is affected by biophysical and socio-economic factors. The first step in the upscaling analysis is to map the land suitable for irrigation using biophysical and socioeconomic factors such as climate, soil, land use, slope, population density, and access to the market. This analysis enables ILSSI to prioritize suitable areas for irrigation for the entirety of Ethiopia. The Soil and Water Assessment Tool (SWAT) is then used to estimate agricultural production, water availability, and irrigation water requirements in all areas suitable for irrigation. Some of the inputs to the SWAT model come from a household survey summary of the current cropping systems and fertilizer application rates at the village level. The outputs from the SWAT model are used by an agent-based model to produce a map that describes the adoption probability of irrigation technology throughout the country. The agent-based model also generates a crop mix for each predefined spatial unit throughout the country, taking into account the prices of irrigated crop products after adoption. Finally, the agent-based model captures the information on average operational and capital costs of input to estimate the aggregated total profitability of small-scale irrigation practices at different predefined spatial units throughout the country.

Progress/deliverables

The irrigation suitability analysis for Ethiopia has been completed. Preliminary results were presented at the 2016 International SWAT Conference in China as a poster. A paper summarizing the completed analysis, entitled “Assessing Potential Land Suitability for Surface Irrigation using Groundwater in Ethiopia,” will be presented at the upcoming AGU conference. The team is also preparing a scientific journal article based on the land suitability analysis for irrigation and the groundwater irrigation potential in Ethiopia. The SWAT modeling is in progress, and the SWAT team has started sharing results with the agent-based modeling. The FarmSIM team is in the process of finalizing its summary of capital and operational input costs, drawing on household surveys collected in Ethiopia from 2012 to 2015. The methodological approach for the agent-based modeling has been established using temporary data, and the model is ready to be updated with additional data from SWAT and FarmSIM.